



GLOBAL ECONOMICS FOCUS

Bitcoin: how worried/excited should we be?

- **Claims that cryptocurrencies will replace established fiat currencies are rubbish; our view is that Bitcoin is a bubble. Indeed, the latest price falls suggest that the bubble is bursting – although with prices still ten times higher than a year ago, they have a lot further to fall yet. At least the economic fall-out from this should be small. And some long-run good will come of the blockchain technology underpinning the spread of cryptocurrencies, although it remains to be seen how big its effects will actually be.**
- **Bitcoin bulls point to its long-run potential to replace national currencies, but there are various reasons to doubt this.** Admittedly, some of these are just technical – such as Bitcoin’s slow processing power – that might be solved over time. **But even if this is the case, Bitcoin is clearly at risk of being usurped by a “better” cryptocurrency.**
- **And replacing national currencies with a cryptocurrency is not economically desirable in any case. A key feature of most cryptocurrencies is that they have an exogenously determined supply, meaning that governments or central banks cannot inflate away their value. But this means that swings in money demand therefore lead to big changes in prices or activity. A widespread adoption of Bitcoin could prompt a re-run of the problems seen under the Gold Standard.**
- **In any case, most people are buying Bitcoin, not because of a belief in its future as a global currency, but because they expect it to rise in value. Accordingly, it has all the hallmarks of a classic speculative bubble, which we expect to burst.** Triggers for the bubble to burst could be a further crackdown by regulators or a major hacking attempt.
- **At the moment, a Bitcoin crash would not have wide economic consequences.** Bitcoin’s market capitalisation is still small; it is not held by institutions; and it has little correlation with other financial markets. That said, the more that Bitcoin becomes a mainstream asset class, the greater the risk of fall-out from a crash. **The advent of Bitcoin derivatives trading, for instance, has made it easier for institutions to get exposure to Bitcoin, potentially raising the systemic risk of a large drop in prices.**
- **Even if Bitcoin is a flash in the pan, the blockchain or “distributed ledger” technology behind it has the potential to be a longer-lasting development with important implications.** Not only could it transform the financial system – by removing the need for banks to act as intermediaries – but it could have applications elsewhere, for example, in maintaining tax and hospital records. A particularly interesting element is smart contracts, which could transform supply chains and trade finance.
- **Another lasting legacy of the cryptocurrency phenomenon could be the issuance of central bank digital currencies.** Note that these would differ from Bitcoin in that they would be a digital form of existing national currencies, rather than a new currency altogether. Of course, digital central bank money already exists to some extent in the form of commercial banks’ reserves. **But blockchain technology could make it feasible to offer all individuals and firms an account at the central bank and – crucially – to allow them to exchange money in the same decentralised way that Bitcoin does.**
- **Varying the interest rate paid on these accounts would give central banks another monetary policy tool. Indeed, if physical cash were phased out altogether, central banks would have the option to set negative interest rates.** Meanwhile, people would have a risk-free way to hold funds. **However, if people moved their money from commercial banks to the central bank at times of uncertainty, bank funding would become significantly more volatile and credit growth would become squeezed.**

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Bitcoin: how worried/excited should we be?

Unless you've been living on Mars, you cannot have missed the Bitcoin phenomenon. In this *Focus*, we address a number of interesting questions posed by the currency's rise, namely:

- What are cryptocurrencies like Bitcoin;
- Is it all a bubble;
- The implications if/when the bubble bursts;
- Bitcoin's potential to replace national currencies;
- What governments need to do about it;
- The (more important) implications of the blockchain technology behind it;
- The potential for central bank digital currencies and the implications of this for monetary policy.

First things first: what is Bitcoin?

Digital currencies are nothing new – anyone who has bought Pokémon coins, for example, will be perfectly familiar with them. They are simply currencies stored and transferred electronically, with no physical form.

However, Bitcoin is one of a special type of digital currencies called cryptocurrencies, whose key feature is that they are decentralised. In other words, the currency is not issued, or controlled, by a central authority like a government or central bank. Instead, a network of computers keeps track of transactions and produces new currency. But how can the system remain safe from fraud and misuse with no oversight from a central authority? The key is the blockchain technology on which Bitcoin runs. (Box 1 explains this in more detail, but be warned, it gets a bit technical!).

Bitcoin was the first cryptocurrency to be created and is still the biggest and best-known. It was created in 2009 by an anonymous developer. Although he goes by the pseudonym Satoshi Nakamoto, no-one knows who he actually is. Nakamoto's motivation was supposedly his desire to create an alternative to our current financial system that would cut out unreliable and untrustworthy middlemen, including banks and central banks. Indeed, on the day that Bitcoin was launched, the headline from the latest edition of *The Times* – “Chancellor on brink of second bailout for banks” – was encoded into Bitcoin's very first building block.

Box 1: What is the blockchain?

Blockchain technology is a type of distributed ledger technology (DLT). A distributed ledger is essentially a database that is shared across a network of users. And its unique feature is that it allows people who have no reason to trust each other to transact, without a trusted authority managing the records.

All participants within the network have their own identical copy of the ledger and any changes to the ledger are reflected in all copies. The security of the assets stored in the ledger are maintained cryptographically through the use of ‘keys’ and digital signatures. Entries are updated by the participants, according to rules agreed by the network. This process is what is known as “mining” – a simplified explanation of which follows.

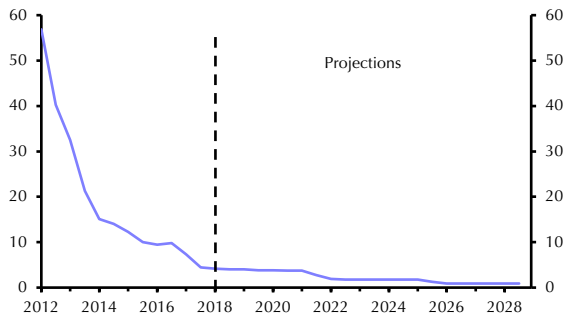
When a transaction takes place – for example, somebody buying something using Bitcoin – a notification is sent out across the network. Computers compete to solve a mathematical problem or algorithm that checks whether the transaction is valid (i.e. that the buyer has the funds). These computers churn out code-upon-code (known as hashes) until they find a combination which confirms that the transaction is valid. This is called “proof of work” and takes so much processing power that generating false entries becomes prohibitive. In return for verifying the transaction, the computer that is the first to solve the mathematical problem receives 12.5 Bitcoins (and a transaction fee); this is how new Bitcoins are created, replacing the current convention where central banks mint new currency.

Transactions are bundled together and added as a “block” to a chain which records all previous transactions. This blockchain gets longer as more transactions take place. What makes it so secure is that each new block is written using the code of all previous blocks. If someone wished to make a change at a point in the chain, they would not only have to re-write the code for that block, but also the code for every single subsequent block. Since this uses a huge amount of computing energy, it is practically impossible. The fact that the blockchain is public also reinforces its security; an altered version of the blockchain would be rejected by other users who could see a fraudulent change.



Because of his concerns about the ability of authorities to devalue currencies by creating more, one of the key elements of Bitcoin is its fixed supply. Bitcoin’s technology is encoded so that the eventual supply of Bitcoin is capped at 21 million. So far, 16.75 million of these Bitcoins have been “mined” and are in circulation. At present, the supply of Bitcoin is growing at a rate of around 4% y/y. (See Chart 1.) But this will soon decline until all Bitcoins have been mined.¹ This is expected to occur in 2140.

Chart 1: Supply of Bitcoin (% y/y)



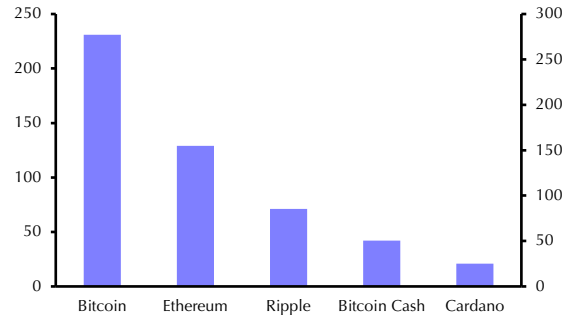
Sources: DGC Magazine, blockchain.info

In theory, the supply of Bitcoin could be altered if more than half of Bitcoiners approved it. But that would defeat the whole point of a cryptocurrency with an exogenously determined supply. Indeed, were the supply to be tinkered with, confidence in the currency would quickly plummet.

One last thing before we get onto the bubble question. As we mentioned earlier, Bitcoin is not the only cryptocurrency. There are now over 1400, the biggest after Bitcoin (at the time of writing) being Ethereum, Ripple, Bitcoin Cash and Cardano. (See Chart 2.) Many of these are variations on the same theme, just with slight technical tweaks. But a particular one worth mentioning is Ethereum. Whereas Bitcoin offers one particular application of blockchain technology (namely a payments system), Ethereum is a platform which allows developers to run any new decentralised applications (with Ether

being the currency with which users pay to do this).² We will discuss the wider uses of blockchain later.

Chart 2: Market Capitalisation of Leading Cryptocurrencies (\$bn)

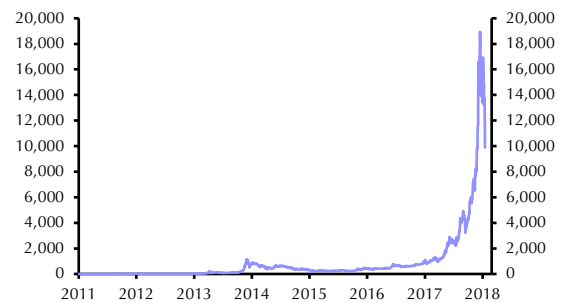


Source: coinmarketcap.com

A big bubble?

The Bitcoin price rose a little in the early days, but it was last year that it really took off. (See Chart 3. Chart 4 zooms in on the past year.)

Chart 3: Bitcoin Price (US\$ per Bitcoin) (2011–2018)



Source: Thomson Reuters

Chart 4: Bitcoin Price (US\$ per Bitcoin) (2017–18)



Source: Thomson Reuters

¹ As more Bitcoins are produced, it becomes harder to solve the algorithm described in Box 1 and therefore to earn new Bitcoins. The reward for solving this algorithm will fall too; at present miners receive 12.5 Bitcoins, yet this is programmed to halve every four years, so in 2020, miners will earn 6.25 Bitcoins for solving the algorithm. The combination of the increasing difficulty and falling reward is what slows the growth of Bitcoin supply.

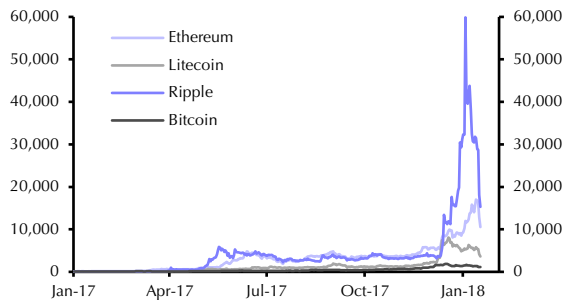
² As one of the Ethereum co-founders puts it: “To take a past example of a similar situation, e-mail is one particular use of the internet, and for sure helped popularise it, but there are many others.”



At the start of 2017, the price of a Bitcoin stood at \$1,000, but by the peak towards the end of last year this had surged to over \$19,000. Prices have nearly halved since then (oscillating between \$9,500 and \$10,000 at the time of writing), but they are still over 10 times higher than a year ago.

These big swings in prices have also been experienced by other cryptocurrencies. These other currencies generally saw their prices start to rise rather later than Bitcoin. But the scale of their rises last year often far eclipsed that of Bitcoin. The price of Ripple, for example, surged by 30,000% last year! (See Chart 5.)

Chart 5: Prices of Selected Cryptocurrencies (Jan. 2017 = 100)



Sources: Thomson Reuters, cryptocompare.com

So is this all an enormous bubble that will – indeed, is already starting to – burst? The first point to make is that gauging the right “value” for Bitcoin is hard because it is not backed by anything. Unlike share prices, it does not have a flow of earnings that can be assessed and forecast. And Bitcoin obviously has no intrinsic value; unlike gold, you cannot make anything out of it, nor does it look nice. In fact, it doesn’t look like anything – it doesn’t physically exist! Of course, modern paper currencies don’t have any intrinsic value either. But unlike dollars, for example, Bitcoin is not backed by a credible authority, such as a central bank or government (although, of course, it was designed this way on purpose). Indeed, it is argued that bubbles are more likely to occur in markets where the fundamentals are hard to assess and participants base their investment choice largely on past price movements.³

Cryptobulls justify Bitcoin’s rise in price by pointing to its long-run potential to take over from cash as a

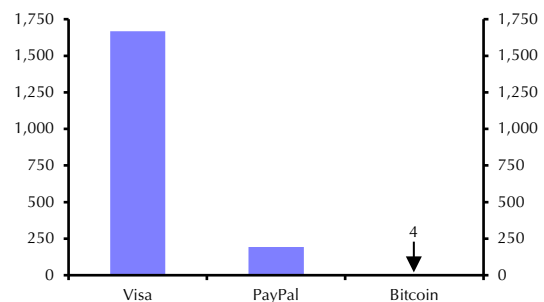
³ See “Bubbles, Rational Expectations, and Financial Markets,” Olivier Blanchard and Mark Watson, 1982

global currency and medium of exchange. Indeed, if that is Bitcoin’s future, then we are just at the beginning. For instance, suppose that Bitcoin were to replace gold as the preferred safe haven commodity and that Bitcoin’s market capitalisation therefore rose to match that of gold’s. Bitcoin prices would rise from their current \$10,000 to \$630,000!

However, we doubt that most of those buying Bitcoin at the moment have meticulously researched its potential as a fiat currency. **Instead, they are buying it because they expect it to rise further in value (#FOMO⁴).** Indeed, Bitcoin is displaying some classic bubble properties. For instance, any company that even mentions the word “blockchain” sees an immediate jump in its value. One example is On-line plc, a British technology services company, which changed its name to On-line Blockchain Plc last October and saw its share price rise five-fold.

In any case, it is very unlikely that Bitcoin has the long-run potential that even sophisticated investors claim. **For a start, Bitcoin in its current form is certainly not fulfilling the function of money as it is traditionally defined.** It is common to think of money as having three main purposes, the first being a medium of exchange. But people primarily just want to hold Bitcoin in anticipation of further gains, rather than use it to buy things. Although there is anecdotal evidence of houses or even islands being offered for sale only in Bitcoin, these are rare examples. In fact, transaction fees are too high to make it a practical means of widespread exchange. Chart 6 shows that the number of transactions per second in Bitcoin is still dwarfed by those through more established payment systems such as Paypal or VISA.

Chart 6: Transactions Per Second



Source: altcointoday.com

⁴ For those out of touch with modern acronyms: fear of missing out.



The other two functions of money are as a unit of account (to measure the cost of goods and services) and a store of value (to transfer spending power from today to the future). But the wild volatility in the price of Bitcoin has made it useless as either of these at the moment. For most people, Bitcoin simply doesn't hold any advantages over current currencies.

Bitcoin's technical shortcomings

But even if Bitcoin is not there yet, does it have the potential to come into widespread use further ahead? We doubt it.

To start with, there are many reasons why Bitcoin does not have the technical capacity to become very widely used. (See Box 2.) Admittedly, such technical problems might be overcome in time. **But if that is the case, then at the very least, Bitcoin is at risk of being usurped by another digital currency which solves some of these problems.**

Indeed, the higher Bitcoin's price rises, the greater the incentive to establish other cryptocurrencies, thus limiting Bitcoin's rise. Although Bitcoin's supply is limited, there is no limit to the number of new currencies that can be created and therefore the overall supply of cryptocurrencies. Bitcoin even creates competition for itself; following differences of opinion about the direction Bitcoin should take, Bitcoin has previously split in two, with a so-called "hard fork" occurring just a few months ago.⁵

Granted, Bitcoin has a first-mover advantage. Just as Facebook dominates social networking or YouTube dominates video-sharing, Bitcoin could triumph amongst cryptocurrencies because it already has a big network of users. Indeed, it's the only one that most people have heard of. And traders are not going to price their goods and services in umpteen cryptocurrencies. Indeed, hundreds of other ones already exist, yet this hasn't prevented Bitcoin's ascendancy. What's more, a move to tighter regulation would make it harder to create new currencies, reinforcing the position of existing ones.

⁵ In this instance, Bitcoin split between those keen to keep the protocol unchanged and those wanting to change it to increase block sizes in order to allow more transactions to be processed on the blockchain. The first group, who were primarily miners who wanted Bitcoin to keep rising in value, stuck with Bitcoin. And the second group, who were focused on making Bitcoin work in the long-run as a global currency, splintered to form "Bitcoin cash".

Box 2: Five technical problems with Bitcoin

First, because of the way Bitcoin's decentralised processing works, transactions times are slow, making it impractical for everyday use. The same technology that makes Bitcoin secure as a means of exchange also makes it extremely inefficient compared to other payment technologies.

Second, because the blockchain works by adding an extra bit of information to the chain of information that already exists, chains are getting too long to store on basic computers.

Third, the amount of energy expended to mine Bitcoin and validate transactions has reached crazy proportions. There are now 159 countries whose energy usage is surpassed by Bitcoin mining. Defenders of Bitcoin say that it is a price worth paying to maintain a new and useful global currency and payment system. (As we explained earlier, in a decentralised system, computing power is what enables the "proof of work" system that ensures its security.) They point out that maintaining a fiat currency uses energy too (for cash machines, printing money, running bank branches etc.) and that mining Bitcoin is no more of a waste of money than mining gold, given that very little gold is actually used to produce anything.

Fourth, we are getting closer to the point where the "monopoly miner" becomes a problem. As the amount of computing power required to mine increases, only large operators are left and we end up with mining cabals, able to promote "forks" in Bitcoin's software and therefore determine its future, making it vulnerable to abuse.

Fifth, Bitcoin owners are at risk of hacking attempts, theft and plain loss of their Bitcoins. Estimates put the number of lost Bitcoins as high as a quarter of those that have been mined so far. People have lost their details, broken their computers etc. – and they cannot simply ring a helpline to request a password reset!



Nonetheless, if any of these other currencies are better than Bitcoin, then the chances are that they will prevail. To take just a couple of examples, Litecoin requires much less processing power than Bitcoin and is therefore better suited to frequent transactions. Meanwhile, Ethereum plans to switch from “proof of work” to “proof of stake”, which will massively reduce its energy needs.⁶ Although proof of stake has some drawbacks, it shows the progress that other currencies are making towards solving some of Bitcoin’s shortcomings.

Indeed, the world of cryptocurrencies has potential parallels with the development of the internet in the early 1990s. Many early incarnations fell by the wayside before those such as Google, Facebook or Amazon gained dominance. Even if we assume that cryptocurrencies in general have a long-run future, only a few will “make it” and no-one knows which ones these are.

Bitcoin’s economic failings

But even if Bitcoin were to overcome its technical shortcomings, **it is still hard, on a more fundamental level, to see it becoming a true global currency.**

Cryptobulls see Bitcoin as having the advantages of gold, while also solving its disadvantages. In particular, both have the supposed benefit of a fixed supply. But whereas gold is hard to transport, a digital currency can be exchanged at a click of the mouse. Indeed, Bitcoin’s advantage over all other payments systems is that, in theory, it allows transactions to occur for a fraction of the cost of the alternatives. And unlike gold, Bitcoins can be divided up easily, facilitating trade.

However, Bitcoin also has some clear disadvantages compared to gold. For a start, it is easier to keep gold safe in an armoured vault than to protect Bitcoin against hacking and theft. Second, gold has a long history as a store of value which Bitcoin cannot compete with. And third, the constraint on gold’s supply is physical, whereas the constraint on Bitcoin’s supply is artificial. How can those of us who do not have PhDs in computer sciences be

⁶ Instead of taking out a proof of work, people could vet themselves by placing a small amount of money into a fund, which they would get back if the validation turned out to be real. By showing they have resources invested, they show their work can be trusted.

100% sure that Bitcoin’s algorithm will really keep supply fixed at a maximum of 21 million?

What’s more, the key advantage of gold that Bitcoin aims to replicate – namely its fixed supply – is also one of Bitcoin’s most fundamental failings. True, it means that governments and central banks cannot increase its supply and erode its value. **But fixed supply in a world of changing money demand results in big changes in prices or, if prices and wages are sticky, output.** This is essentially what happened when being on the Gold Standard – with currencies linked to the supply of gold – exacerbated the great Depression in the 1930s. What’s more, if Bitcoin were to be used globally, then – again, as with the Gold Standard – all countries would effectively end up with fixed exchange rates. This would severely limit their scope to deal with changes in domestic economic conditions.

Indeed, if it looked like Bitcoin really were about to replace national currencies, then central banks and governments would almost certainly step in to prevent it. In fact, more likely than a private sector cryptocurrency taking over the world is that central banks will develop their own digital currencies to stave off the spread of Bitcoin. In the extreme, this could be the development of a new cryptocurrency designed to optimise economic growth. This would probably involve setting the growth rate of the money supply at a rate that matches economic demand, with policymakers presumably having the scope to vary this growth rate. But more likely is that central banks use blockchain technology to digitise more widely (or even fully) their existing currencies, therefore facilitating the cheaper and faster peer-to-peer transactions that Bitcoin promotes. We will say more about central bank digital currencies later.

When will it burst?

The upshot so far, then, is that we doubt that Bitcoin is about to take over as a world currency. **In our view, it is a bubble. However, when it will fully burst is anyone’s guess and prices could yet rise again, before they fall further ahead.**

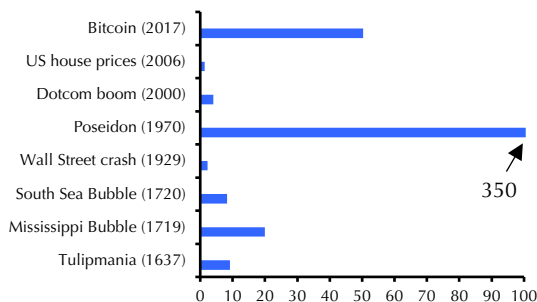


The rise in prices has already far surpassed that seen in most previous bubbles. Chart 7 shows some of the major speculative bubbles in history which subsequently turned to bust, namely:

- The Dutch Tulip Bubble, when the price of tulip bulbs exploded in the 1630s.
- The Mississippi Bubble in 1719, when shares soared in the Mississippi company, which was supposed to benefit from France’s alleged riches in the Louisiana region.
- The South Sea Bubble in 1720, when shares in the South Sea Company soared on expectations that it would reap bumper profits from trade with the South Seas (the Spanish colonies of South America).
- The Wall Street crash of 1929 that heralded the start of the Great Depression.
- The dotcom bubble in the 1990s, when the introduction of the internet triggered a wave of speculation in “new economy” businesses.
- The rise in US real estate prices before the financial crisis of 2007/8.

As the Chart shows, the rise in Bitcoin prices over the past three years – a 50 fold increase if we use their recent peak at the end of last year as our comparison – far surpasses the increases in asset prices seen in any of these other bubbles. Some of these bubbles (e.g. the dotcom boom) lasted for more than the three years that we have shown in our chart, but adjusting the time period used does not alter the big picture. (In fact, it makes it even starker, as over the past five years, for instance, Bitcoin prices have risen 1500 fold.)

Chart 7: Rise in Prices During Bubble in 3 Years to the Peak (Multiple of Starting Price)



Source: Various

That said, in the case of the dotcom boom/bust or Wall Street crash, there were individual stocks that saw much bigger rises than the stock market indices as a whole. For example, one of the biggest risers in the dotcom boom was Qualcomm, a company involved in wireless technology, which saw its share price rise 37 times over the three years up to its peak, not that far off the scale of Bitcoin’s rise.

What’s more, Bitcoin’s rise is not completely unprecedented. In particular, the bubble in Australian mining shares in the late 1960s/early 1970s was even bigger. This was triggered by the Poseidon company’s discovery of a promising site for nickel mining in September 1969. Poseidon stocks rose from \$0.80 in early September 1969 to a peak of \$280 in February 1970, before they crashed. Accordingly, they rose 350 times over the space of just a few months. If this is anything to go by, we clearly cannot rule out Bitcoin prices rising even further before they crash.

What might be the trigger for the Bitcoin bubble to burst? One leading candidate is a further crack-down by regulators on cryptocurrencies. Indeed, Bitcoin prices fell by about 30% in September 2017 when China’s Bitcoin crackdown resulted in the shutdown of the country’s biggest Bitcoin trading exchanges. And they fell at the start of January this year when South Korean authorities considered a ban on cryptocurrency trading.

Admittedly, Bitcoin bounced back on previous occasions (although it has yet to recover its most recent falls). But regulation is only likely to get tougher. In particular, regulators are erring towards forcing traders to disclose their identity – and removing the anonymity of Bitcoin could seriously undermine its attractiveness for many. And the more widespread Bitcoin becomes, and the greater the threat it poses to tax collection or the effectiveness of monetary policy, for example, the more likely authorities are to restrict its usage.

Note that a key trigger for the ending of the South Sea Bubble was effectively tighter regulation, namely the introduction of an act to ban the formation of



unauthorised corporations trying to piggyback on the South Sea Company’s success.⁷

An alternative trigger for prices to drop could be a major security hack. The 35% drop in prices in February 2014 was due to the announcement by trading-place Mt. Gox that it had been hacked. **Meanwhile, a rise in derivatives trading could trigger a fall.** (Although there are already some Bitcoin derivatives, the industry is still in its infancy.) Opinion amongst educated investors appears generally to be that Bitcoin is a bubble. Until now, the only way that sceptics could influence the market was by staying out of it. With the arrival of futures, though, investors can actively bet against Bitcoin.

However, triggers for the bursting of bubbles can be totally unpredictable and unrelated to the bubble itself. One theory for why the Dutch tulip bubble ended is that an outbreak of the bubonic plague resulted in no buyers turning up for a routine tulip bulb auction in Haarlem. Moreover, there need not even be a trigger at all; sometimes speculative bubbles just run out of steam. The Wall Street crash of 1929 ended much this way. Before the major crash on 24th October, shares fell a bit over September and October, with investors gradually taking fright as press coverage of the falls increased (although the threat of public utility regulation didn’t help).

Previous speculative bubbles do not give a clear indication of how long the Bitcoin bubble will last either. The South Sea bubble, for example, started and finished within a year, whereas the dotcom bubble grew over the course of about a decade. Admittedly, even in fairly drawn-out bubbles, the sharpest rises in prices generally took place over a relatively short space of time; and once prices got to their peak, they generally fell sharply straight away, rather than plateauing for a while. Given that Bitcoin prices have risen exponentially in the past few months, this might suggest that the end is nigh.

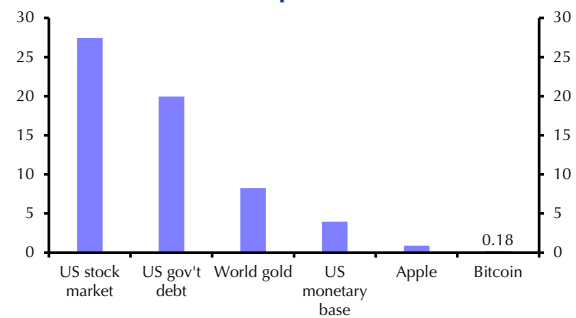
⁷ “Famous first bubbles,” Peter M Garber, The Journal of Economic Perspectives, 1990

What if the bubble bursts?

So we think that Bitcoin is a bubble that will burst. **But the good news is that, as long as the bubble bursts quite soon, the fallout should be modest.**

First, although there may be a hit to household spending as people who have invested suffer losses, Bitcoin’s market capitalisation is too small for this to be a major worry. It is currently around \$180bn, which is much smaller than the total value of gold outstanding (\$8trn) or the market capitalisation of Apple (\$0.9trn). (See Chart 8.) If the price of Bitcoin fell to zero today, the paper losses would be equivalent to a 0.5% fall in US equity prices. As most investors have bought Bitcoin at much lower prices, the relevant losses would arguably be smaller.

Chart 8: Market Capitalisation (\$ trillion)



Sources: Thomson Reuters, World Gold Council, bitcoin.com, CE

A recent survey of 2,000 adults in the US by Blockchain Capital showed that only 2% of people owned Bitcoin. And a study by the Cambridge Centre for Alternative Finance of use in 38 countries (admittedly, almost a year ago), suggested that the number of active users of cryptocurrencies was between 3m and 6m – equivalent to less than 0.1% of the world’s population.

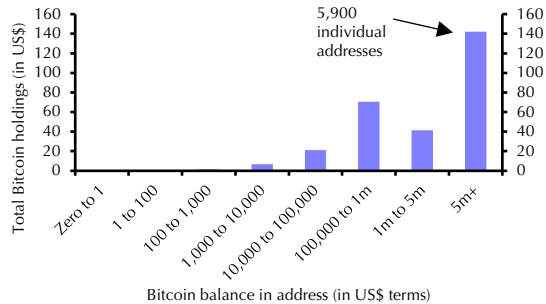
Indeed, Bitcoin holdings appear to be concentrated among a few thousand high net worth individuals. **Although there are no figures on Bitcoin holdings by individual or institution, we can look at the distribution of holdings by Bitcoin addresses** (which are used to make transactions)⁸.

⁸ This is not ideal, as one person can use multiple addresses; indeed, to protect their anonymity and prevent third parties from viewing all the transactions associated with their account, users are encouraged to generate a new address each time they transact. At the same time, though, there are some addresses (such as those used by the “cold storage” element of Bitcoin exchanges) that cover Bitcoin holdings by multiple users. But this data can at least give us some, albeit imperfect, idea of the distribution.



Half of the current stock of Bitcoin is associated with just 5,500 addresses, each containing at least \$5m or approximately 300 bitcoins. (See Chart 9.) These holders could presumably bear the losses fairly easily.

Chart 9: Breakdown of Bitcoin by Amount in Address



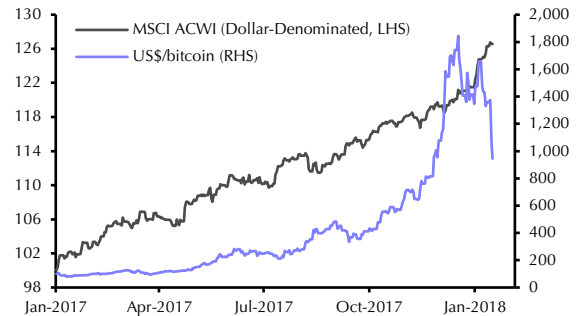
Source: bitcoinprivacy.info

This would still be a worry if these addresses with large amounts of Bitcoin were institutional investors. But they have so far reportedly stayed away. Instead, many of the biggest holders are people who made early investments in the digital currency. For example, it is thought that Satoshi Nakamoto holds around 1m of the 21m circulating bitcoins. Governments who have confiscated Bitcoin from criminals also apparently hold a lot. **Big losses for any of these would not have major systemic implications.**

Also, there is no evidence that people are taking out huge, sub-prime mortgages to finance their speculation in cryptocurrencies. (In fact, some UK banks are reportedly unwilling to give mortgages to people whose deposit comes from money made through investing in Bitcoin.) Indeed, it is not unprecedented for large speculative bubbles to burst with little wider impact. Research shows that key to whether the bursting of a bubble causes economic damage is whether or not it was accompanied by a lending boom. So far, that's not the case.

A slump in Bitcoin prices should not have much effect on wider investor and business confidence either. Fluctuations in Bitcoin's price have not been correlated with movements in the price of other risky assets (See Chart 10.)

Chart 10: MSCI ACWI & US\$/Bitcoin



Source: Bloomberg

Nor has Bitcoin had much of a correlation with safe-haven assets, like gold. Admittedly, the price of both gold and Bitcoin rose in August and September last year when tensions on the Korean peninsula mounted. However, Chart 11 shows that there are even more instances where Bitcoin has had no correlation with the price of gold at all. Given this, we do not think that a fall in the price of Bitcoin would have a substantial knock-on effect for the price of the precious metal.

Chart 11: Bitcoin & Gold Prices



Sources: Thomson Reuters, Capital Economics

However, there are still some reasons for concern. First, we mentioned earlier that the bubble might well inflate significantly further before it bursts. In that case, the pool of people who could end up experiencing larger losses might widen. That's not a worry for people who just see their existing holdings increase in value; but it might be a problem for those who have bought in at high prices.

Second, we don't know the size of indirect exposures to Bitcoin via derivatives. For example, Bitcoin trackers are apparently popular in Sweden, while the Japanese have been making leveraged bets on Bitcoin price movements on the bitFlyer exchange.



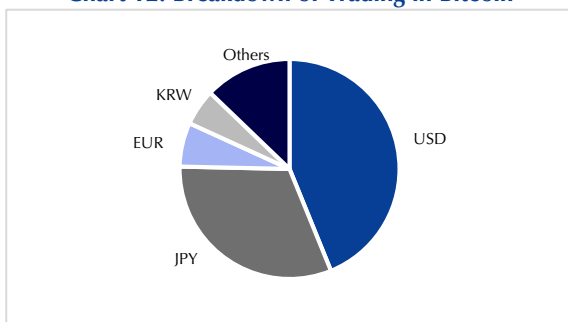
What’s more, Bitcoin derivatives are now beginning to enter the mainstream, with Bitcoin futures trading recently launched in the US for the first time and Interactive Brokers recently announcing that it will allow customers to short Bitcoin. Steps such as this will make it easier for institutional investors to get involved, by taking away some of the hassles of investing in Bitcoin directly and giving them instruments to hedge for its volatility.

An increase in the use of derivatives does not necessarily increase the potential economic losses from a Bitcoin crash. There are two sides to every financial contract – so for every person losing money on a Bitcoin trade, there will be someone gaining. Accordingly, it is the distribution of these derivatives that matters. But there is certainly a good chance that derivatives widen the systemic risk, as it makes it more likely that an individual systemically important institution is at risk of making large losses.

And third, some countries may be more exposed than others to a potential bursting of the Bitcoin bubble. Although there are no geographical data on Bitcoin holdings, there are other ways of getting a feel for where Bitcoin holdings are concentrated.

For a start, we can look at where Bitcoin is mined and traded. It was estimated that, until recently, 70% of mining was in China because of its cheap equipment and electricity. Most of trading in Bitcoin was also therefore done in the renminbi until the government cracked down. Now the proportion of mining undertaken in China has fallen to closer to 50%. And the currencies of choice for Bitcoin trading are now the US dollar, euro, yen and South Korean won. (See Chart 12.)

Chart 12: Breakdown of Trading in Bitcoin

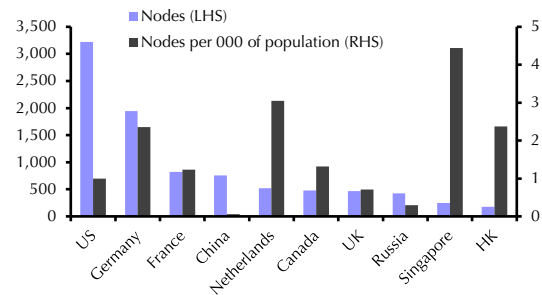


Source: cryptocompare.com

Another way of measuring Bitcoin activity is to look at estimates of the number of reachable nodes.

(Nodes are the computers that connect to the Bitcoin network). The US and Germany have the most nodes. But when adjusted for the size of their populations, the Netherlands, Singapore and Hong Kong also stand out. (See Chart 13.)

Chart 13: The 10 countries with the most reachable nodes



Source: bitnodes.earn.com

What else do policymakers need to worry about?

So a bursting of the Bitcoin bubble probably would not have major economic implications. However, this is not the only thing that policymakers have to worry about. Bitcoin raises some other important issues for governments and central banks.

First, they need to stem any rise in criminality and money laundering that arises from the more widespread use of Bitcoin and the anonymity that it affords. The EU, for example, is considering setting up a database of people who use Bitcoin exchanges.

Second, they need to work out how to tax it – which depends in part on how Bitcoin is classified. The US tax authorities, for example, have decided to classify cryptocurrencies as property and any gains are therefore subject to capital gains tax. The authorities also need to make sure that use of Bitcoin does not lead to more widespread tax evasion and avoidance.

Third, there is the issue of regulation. Policymakers face a trade-off between protecting consumers and not stifling a sector at the forefront of the technological industry. The Brazilian central bank, for example, recently issued a communique in which it “warns about the risks derived from storing and negotiating virtual currencies”.

One issue at the moment is that it is not necessarily illegal for big holders of some cryptocurrencies to discuss trading with another and, in effect, manipulate the market. Given the nature of



cryptocurrencies, their regulation will require more international cooperation than otherwise.

The rise of Initial Coin Offerings (ICOs) is another problem. Whereas IPOs sell investors a share of a company, ICOs give them a coin or token in the new company, which can appreciate in value if the company is successful. Many ICOs are designed to finance applications that will make use of the blockchain, such as trading currencies or searching for jobs. But in plenty of cases, an ICO is just a way to raise capital without all the hassle of meeting regulatory requirements. In the US, the Securities and Exchange Commission has ruled that these coins may, in some cases, be securities and therefore subject to regulation. The Chinese have gone further, declaring that new ICOs are simply illegal.

And finally, Bitcoin can conflict with policymakers' other objectives. For example, it has been used to circumvent exchange and capital controls, in countries including Greece and Venezuela. **And the increased use of digital currency threatens to make monetary policy less effective.** Obviously monetary policy works by affecting the price or quantity of a national currency but if people are using Bitcoin instead, central banks will find it harder to influence monetary conditions. In the extreme, it is possible to imagine a fractional reserve banking system being set up based solely on Bitcoin, but entirely out of the scope of monetary policy.

Blockchain technology is where the potential lies

So there are various issues to do with Bitcoin that policymakers need to address. More importantly, even if Bitcoin proves to be a flash in the pan, **it is widely thought that the blockchain technology that lies behind it does have long-lasting implications and is actually the exciting part of this whole thing.**

This new way of record-keeping that we described at the beginning could, for a start, transform the financial system. It would bypass the need for banks to act as intermediaries, therefore reducing the cost of financial intermediation and increasing financial inclusion. Santander has estimated that DLT could reduce banks' infrastructure costs attributable to cross-border payments, securities trading and regulatory compliance by \$15-20 billion per annum by 2022.

But there are many potential uses beyond the financial sector – such as in maintaining hospital records, tax records or land registries. One of the forerunners of making use of DLT has been the Estonian government. The Estonians have been experimenting with a form of distributed ledger technology known as Keyless Signature Infrastructure (KSI), which allows citizens to verify the integrity of their records on government databases. This has helped Estonia to launch digital services such as e-Business Register and e-Tax. Meanwhile, the government of Dubai has already launched its own cryptocurrency, based on blockchain technology, called emCash, which people can use to pay for various government and non-government services.

One especially promising aspect of DLT is the potential for smart contracts. These encode the terms of a traditional contract into a computer system and execute them automatically. There are many potential uses for smart contracts, including reducing the time taken to settle securities trades, in supply chains and mortgage contracts. Trade finance is a good example; smart contracts could eliminate the current need for a large number of manual checks to verify the legitimacy of a client, its trading partners and the goods that change hands. Indeed, DLT might be especially useful to developing economies, where credit-worthiness can be harder to establish.

This is a big topic with many questions. Advocates of DLT claim that it is a major technological step forward, while sceptics argue that it does nothing that existing technology could not do with a bit more flexibility. Who is right? What will the impact be on productivity and the economy? Are we talking about a major change like the advent of the internet, or are such comparisons overdone? Will the effects be captured adequately within conventional measures of activity and GDP? For example, investment in DLT is increasing rapidly – and we already know there are difficulties with measuring intangible investment. Given this is potentially such an important topic, we plan to address all these issues in a separate piece of work.

Central bank digital currencies

The final aspect of all this that we want to discuss is the potential for central banks to create their own digital currencies.



Note that these do not have anything *directly* to do with Bitcoin. Central banks would not be creating a new currency – we are just talking about a digital form of existing, credible, national currencies.⁹ And central bank digital currencies (CBDC) are in fact nothing new; we have had them for many years in the form of commercial banks’ reserves with central banks. After all, these are not physical reserves.

So what would be new about CBDC? The key innovation would be using blockchain technology to put central bank money on a distributed ledger.

This would allow – as Bitcoin does – the exchange of money in a decentralised way (known as peer-to-peer) without the need for a central intermediary or server. This is different from existing forms of electronic central bank money, like reserves, which are exchanged in a centralised fashion across accounts at the central bank. What’s more, this technology would make it possible to offer all firms and individuals, rather than just commercial banks, an account at the central bank. **The launch of central bank digital money could therefore even be part of a process to abolish physical cash altogether.**

Why would central banks want to do this? First, we discussed earlier how central banks might be keen to prevent private cryptocurrencies from being widely adopted, given their potential to hamper the transmission mechanism of monetary policy. One way to stave off Bitcoin’s threat is for central banks to develop their own digital currencies. This would give individuals a way to undertake cheap and fast peer-to-peer transactions without the need for Bitcoin itself.

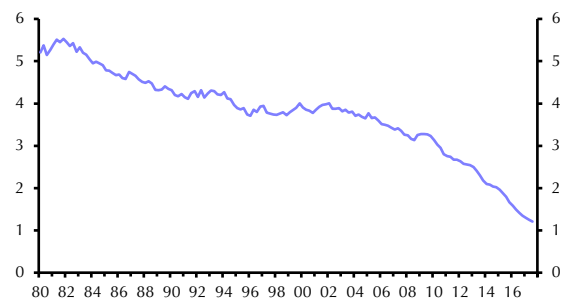
Second, a decentralised system of transactions would eliminate the reliance on the current system of banking and bank reserves, and avoid the system being brought down by one component failing.

Third, by providing a genuinely risk-free alternative to bank deposits, a shift to digital cash would reduce the need for government guarantees on deposits, eliminating a source of moral hazard from the financial system. Bank of England researchers have estimated that CBDC issuance of 30% of GDP could permanently raise GDP by as much as 3%, due to reductions in real interest rates, distortionary taxes, and monetary transaction costs, even during normal economic times (i.e. when the zero lower bound is not binding).

Fourth, if physical cash were to be abolished, this would remove the problem of the zero lower bound on interest rates, allowing central banks to implement negative interest rates if required. Meanwhile, true helicopter drops would be easy; central banks could simply credit everyone’s central bank account with some money.

Central bankers have already got quite far in thinking about all this. China is already testing its own CBDC. And the Riksbank has done a lot of research into it, spurred on by the fact that cash usage in Sweden has fallen to pretty low levels. (See Chart 14.) Other central banks researching the topic include the Bank of England and the Reserve Bank of India.

Chart 14: Swedish Note & Coins in Circulation (As a % of GDP)



Source: Thomson Reuters

⁹ Our discussion here is focused on established and credible central banks issuing electronic forms of their *existing* national currencies. This is different from, for example, Venezuela’s recent announcement that it will launch a new currency, the petro, to shore up its economy. This currency is to be backed by oil reserves and is totally separate from its existing currency the bolívar. Digital currencies cannot be used to cure the fundamental problems in a country where its national currency is plummeting in value.



Note, though, that not all central banks are convinced about the need for central bank digital currencies. The Governor for the Reserve Bank of Australia, for example, recently gave a speech in which he said that putting the RBA into direct competition with the private banking sector in terms of deposits and payment services “is not a direction in which we want to head”.

Indeed, central banks would need to think carefully about the long-term implications of introducing CBDCs for the banking system and monetary policy. These would in part depend on how much interest central banks paid on their digital currency. One possibility would be to pay no interest at all, so that CBDC was literally just e-cash – a digitised form of banknotes. In that case, the implications might be limited.

Alternatively, central banks could pay interest on their digital currency. In that case, they could make it into another monetary policy instrument and use it as another measure for setting a floor for risk-free rates in the economy. If they wanted, central banks could even choose to set different rates for different types of customers e.g. individuals versus banks versus non-bank financial institutions.

As for the implications for the banking system, commercial banks’ margins could be squeezed a bit. Banks would have to pay a slightly higher interest rate than the central bank was offering in order to persuade people to put their money on deposit with them, rather than at the safer central bank.

But more importantly, in times of economic and financial uncertainty, people might move most of their money from commercial banks to CBDC. That would leave banks reliant instead on – even more unstable – wholesale forms of funding. The central bank would therefore need to adapt its lender of last resort role to the fact that commercial banks’ reserves and deposit base were now more volatile. While having all retail deposits secured on safe assets would appeal to advocates of narrow banking, the downside would clearly be a potential contraction in the supply of credit as banks’ funding bases shrank. Indeed, at the extreme, the whole current system of fractional reserve banking could come under threat.

Conclusions

Overall, then, we doubt that any cryptocurrency has, or will have, the capability to take over as a new global currency. Nor would it be desirable. So authorities probably wouldn’t let it happen in any case. **Indeed, Bitcoin may not even exist anymore in a few years’ time.**

Even if Bitcoin dies a death, though, it may leave a legacy in terms of the blockchain technology on which it is based. However, this is unlikely to have major effect on the economy or monetary policy in the foreseeable future.



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